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CHOLERA AND WATER. (2)

Read in
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AN ADDRESS DELIVERED

AT THE

ANNUAL MEETING OF THE SOUTH INDIAN BRANCH,
BRITISH MEDICAL ASSOCIATION,

8TH JANUARY, 1886.

BY

SURG.-GENL. M. C. FURNELL, M.D., F.R.C.S.

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May

GENTLEMEN,

It is I find customary for the President to address our Society on the first meeting of its new year, and I feel proud that it has fallen to my lot, however unworthy I may be for its performance, to address you on this our third Anniversary.

I regret very much that lengthened absence from Madras has prevented my frequent attendance at your meetings but I congratulate the Society on the regularity with which these meetings have been held; and the many interesting papers which have been read.

During the year, eleven new members were enrolled, one died, and seven resigned leaving a total of seventy-one members, an increase of three over the previous year. Eleven meetings were held and the proceedings of all these have been published.

As must unfortunately always be the case, death and promotion have during the past year thinned our ranks. Dr. Macrae an accomplished officer who took much interest in the foundation and subsequent proceedings of our branch of the Society has passed away, a fate which for some years past has been to his many friends only too evidently impending. He was in all branches of his profession a remarkably well-informed man, but if I mistake not excelled particularly as a Chemist, his chest affection if I remember rightly was the cause of his relinquishing the chemical chair in the Medical College.

Surgeon-General Cornish in the fulness of time has also left us, not, we are thankful to say, for that bourne from which no traveller returns, but for his native country to enjoy let us hope for many years to come his well-earned pension and honours.

When my predecessor addressed the Society last year the Battle of the Microbes was still pending; it can scarcely be said that it is yet ended, for though the commission ordered by the Indian Government to report upon Drs. Klein's and Gibb's investigations has just given to the world the result of their deliberation, its condemnation of Dr. Koch amounts after all, as the Lancet remarks, to a verdict of "non proven." I prefer to reserve my own judgment on the matter until I hear what Professor Koch and his friends have to say in reply.

The question which concerns us however as practical medical men, especially in India is this, can anything be done to prevent these constantly recurring epidemics of cholera? I answer Yes. The remedy lies in the hands of the Authorities if they will but have the courage to use it, and it is this—to provide the people with a pure and uncontaminated water supply. In this, which in no way militates or interferes with general sanitary improvements, lies, it seems to me, our safeguard, at any rate in Southern India, against these constantly recurring epidemics of cholera, (I say Southern India because I have no desire to intrude on the domains of sanitarians in Upper India). During the last five years it has been my duty to visit all parts of our Presidency, and shortly after I became Sanitary Commissioner, I was struck with a fact which, although patent and before my eyes every day during the previous 25 years of my service, had never, simply I suppose because it was not my business, attracted my particular attention. And it is this, every hamlet, village, and town in Southern India, and it is more or less the case all over this immense continent, has a water supply open and easily open to the foulest contamination. As you are aware the usual water supply of every place is a large open tank, one or more according to the size of the place. In these tanks the inhabitants proceed to wash their persons after obeying the calls of nature; wash their dirty clothes, often clothes taken from patients that have died of cholera, and take home bright chatties of the water thus sullied as drinking and cooking water to their homes. Now supposing water is an agent when contaminated with the cholera contagium (I use the word “contagium,” condemned as it is by a high authority in this country for want of a better) in spreading cholera we see at once that the habits of the people favour in every way its spread.

Then comes the question, or rather two questions arise:—

1. Have we any proof that water contaminated with cholera dejecta will spread cholera?

2. Have we any proof that a people supplied with a pure and uncontaminated water supply escape cholera?

I myself cannot understand how any one, at any rate any one in our profession, can have any doubt as to what answer should be given to the first question. The famous Broad Street case, so lucidly reported by Snow 30 years ago, ought one would imagine to have settled the question for ever; but since then an immense amount of evidence has been accumulating, especially in Europe and America

on this point. The only reason for scepticism lies I fancy in the fact that the evidence is buried in an immensely scattered literature. No one seems as far as I can ascertain to have brought the evidence together in a concrete form. I have during the past year attempted to do so for my own information, and by the kindness of Government I hope shortly to be able to lay it before the profession in a printed state. It would take up too much time for me to answer at length the first question this evening, as I wish to confine my remarks more especially towards answering the second question, but I will mention two very singular cases on this point not generally known which have passed under my observation.

Salem, the capital of the Collectorate of the same name, has had for many years past a most unenviable notoriety for cholera epidemics. If cholera appears in Southern India, Salem is almost sure to suffer. The water supply, presuming always water plays a role in these epidemics, is such as to favor in every possible way this spread of cholera. The town is bisected by a small shallow stream, a roaring cataract during rainy weather, a series of shallow puddles, scarcely flowing, in dry weather, which as we know is by far the longest period of the year. In this stream the Brahmins and Hindoos of caste wash their bodies, clothes, and from it take home bright chatties of the fluid to drink and cook with. Mussulmen and non-caste people are not allowed to touch this stream, for it is sacred. It is consecrated to Vishnu. Now a curious circumstance has been noticed in these epidemics of cholera at Salem that it falls with much greater severity on the Brahmins and caste Hindoos who use this water, than in any other portion of the community. This was particularly noticed in the epidemic of 1881 when the Brahmins and caste people suffered very severely; the Europeans lost not one person (but of course they are, compared with the others very few in number,) the Mussulmen lost a few cases, but most curious of all the Chucklers and Pariahs lost not one person; although these last are, as we know, from the nature of their occupation an uncleanly people. But then they are strictly forbidden to come near the stream lest they should pollute it, and they draw their water from wells.

Moreover Mr. Stokes the Collector, a man of great energy and intelligence, on his own responsibility took means suddenly to prevent the Hindoos from taking water home from the river. This step was followed by an immediate diminution of mortality. The

people with usual gratitude subsequently sent in petitions to Government against the Collector complaining of this high handed encroachment on their rights.

Cuddapah, or a suburb of it suffered from cholera in 1883, and here again a curious circumstance pointing to impure water as the cause, manifested itself. The cholera was in the hamlet of Yerranukapalli through which flows the small stream the Bogra, this like most streams in Southern India is a swift flowing river in the monsoon; a series of sluggish scarcely moving puddles in the hot season. Cholera broke out when the stream was sluggish and here again was confined to the Sudras a caste people living on the banks of the river and using its water for every purpose. Curiously enough just across the main road within twenty yards is a hamlet inhabited by Malahs (pariahs) amongst these not one case of cholera occurred, but then mark, they are not allowed by the Sudras to use the sacred stream, and are obliged to draw their water from a large well which happily they possess. There was additional evidence concerning this stream; a little way above the village is the place where the dhobies wash the clothes, and it was discovered that previous to the outbreak of cholera in Yerranukapalli clothes of cholera patients from a neighbouring village had been washed in the river above. 'This may be called by some a "mere coincidence," but I confess I prefer the plainer and more obvious inference that a contaminated water supply is an important factor in the spread of cholera.

I could multiply these cases from facts which have come under my knowledge in this Presidency during my tenure of office as Sanitary Commissioner, but the limits at my disposal this evening forbid my doing so.

I will proceed to the second question.

2. Have we any proof that a people enjoying a pure and uncontaminated water supply escape cholera?

The evidence on this point amounts to nothing more than circumstantial evidence, but I think it is circumstantial evidence of a very convincing kind. Exact evidence, unless we proceed to experiments which humanity is said to forbid, it is almost impossible to produce in a question of this sort.

We will first take our own Presidency which contains, a few, alas too few cases in point.

There is Guntur in the Kistna Collectorate. For many years this Guntur place was like Salem famous for cholera epidemics, a sort of head centre of cholera whenever cholera appeared in the Ceded Districts ; since 1868 it has enjoyed a singular immunity ; so much so that Government called for a special report on the subject, and this is to be found in the Sanitary Commissioner's Report for 1879. Suffice it to say that since 1868 the town of Guntur has been free from cholera even when cholera was raging in the district around ; and what is the reason ? I consider it is owing to its improved water supply. Dr. Bigg Wither who first took its conservancy in hand certainly paid attention to all its wants ; here is what his successor Dr. Tyrell writes :—

“ In pre-municipal days simple sanitary laws were ignored by the natives who detest sanitary officers and sanitary measures.

“ It is mentioned that ‘ local sanitary improvements, so far as yet known, are the only real safeguards against epidemic diseases.’

“ Now let me just mention what these have been in the town since it was brought under municipal laws. *First*—as regards the soil.

“ The surface of the soil was everywhere in pre-municipal times polluted daily by filth and rubbish of all kinds which were allowed to accumulate in the courtyards of houses, in open spaces, and by the sides of the streets, lanes, and by-lanes of the town.

“ With this filth there was certainly a good deal of fœcal matter mixed up, and this fœcal matter in seasons when cholera was prevalent would contain the special poison or germ which is supposed to develop it, and which would be diffused by being exposed to the influence of winds throughout the town.

“ The sub-soil all over the town was also polluted with fœcal matters, which were deposited by the people in the numerous privies which were only occasionally, I believe, cleaned out by letting pigs run into them to eat up the excrement.”

“ Scavengers were in those days unknown in the town, and hence those who now and then cleaned their privies sought the assistance of the pigs, of which I am told great numbers existed here belonging to the Wudder people.

“ *Secondly*.—Then the houses occupied by the inhabitants were never cleaned or whitewashed as is done now once a year under municipal regulations. The chattrams in the town to which travellers from all parts of the country and pilgrims from Juggornanth

and Pooree to Rámasvaram resorted were always kept in an extremely filthy condition, and their courtyards contained filth of all imaginable kinds.

“Now-a-days these chattrams are linewashed as often as thought necessary by the Sanitary Officer, and no filth is allowed to be kept in the courtyards.

“*Thirdly.*—The conservancy of the streets, lanes, and by-lanes, and of all open spaces in the town is now regularly attended to by the scavengers employed by the Municipality.

“There was no conservancy in pre-municipal days, and filth was allowed to remain until washed away by a heavy fall of rain. There was no conservancy of courtyards then as now, for nothing noxious can be kept by the people in them, as the conservancy overseer inspects them daily to see if they are kept clean.

“If filth be found in them the owner is directed by notice to remove it at once.

“*Fourthly.*—Formerly prickly-pear and croton plants were found in every part of the town, and especially in the outskirts. Into them filth of all kinds was thrown and they favored the commission of sanitary nuisances, for people flocked to their neighbourhood to answer the calls of nature.

“At present no prickly-pear bushes, or clumps of croton are found anywhere about the town within municipal limits, to afford shelter for the commission of such offences.

“*Fifthly.*—No attention in those days was paid to keep the water in the tanks, reservoirs, and wells clean.

“When I came here in December 1870 I was astonished to see the natives polluting the water-supply everywhere, but particularly in the reservoirs.

“Here were found people washing their mouths of a morning, spitting the foul water out of them into the reservoir, washing their soiled clothes, bathing their persons, and doing other dirty acts which the authorities ought not to have allowed.

“The tank-banks in the wet and the beds in the dry weather were converted into privies by people of all classes—the intelligent Brahmin, the ignorant Pariah, the Government official, and the poor cooly were all found defecating on the banks, and beds of the tanks which supplied their reservoirs with drinking water.

“Most of the wells in the town had no parapet walls, and as the natives, especially Komatee and Brahmin women, resorted to them for bathing and washing their soiled linen, all the impurities contained on their persons and in their foul clothing were carried back into the well with the spilled water.

“During the prevalence of cholera, cloths stained with cholera discharges were no doubt washed here, and the water thus poisoned was drunk by thousands.

“At present the reservoirs, and tanks are watched by men appointed by the Municipality to see that no pollutions of the kind enumerated are made by the people who resort to them for water.

“All the public wells with one or two exceptions are provided with parapet walls, platforms and posts with wheels to facilitate drawing of water.

“Most of the wells within private compounds are also similarly protected.

“*Sixthly.*—The food-supply of the people is regularly inspected by a servant of the Municipality, so the eatables that are found to be unfit for human consumption are not allowed to be sold but destroyed at once.

“This was not done in pre-municipal days, when the Komatee bazaarmen sold unsound articles of consumption.

“Cholera has prevailed on some occasions in the neighbouring villages, but no case occurred in the town.

“Even during the famine when it was prevalent throughout the district in the villages close to Guntur and also in the famine relief camp situated two miles to the north of it, there was no case developed in the town.

“I have been here since December 1870 (except for the time from October 1877 to May 1879 when I was at Bunder and on furlough to England), and I am prepared to state that during the time I have been in charge of it as Medical and Sanitary Officer, I have not known of the occurrence of a single case of cholera.”

“Now, the question that one would be naturally inclined to ask is, why the town which of yore was frequently visited by cholera should since the introduction of municipal laws and regulations, based on sanitary principles, be free from it?”

“The answer is, that to the changes which have been effected in the sanitary condition of the town, must be attributed the immunity which the town has enjoyed from attacks of the disease.”

“ I know of no other causes at work than those I have enumerated to which this freedom can be ascribed.”

“ In pre-municipal days the town was in a highly insanitary condition, when there was everything to favor the development and spread of cholera, once it was introduced by the methods mentioned in the reports of medical officers already copied.

“ Since those wholesome laws and regulations have been brought into operation, the condition of the town has been in a sanitary point of view considerably improved, and all disease-generating causes have been removed and are being removed as detected without being allowed to remain and become the centres from which diseases of an epidemic nature may develop and spread.

“ All my endeavours as Sanitary officer have been, and shall be directed to maintain this town in as good a sanitary state as I can by removing all those conditions which led to insanitation and favor the development of epidemics ; and thus far under God’s blessing the health of this town has been, I am pleased to report, remarkably good.”

But as we all know the moment an energetic conservative officer of the stamp of Doctor Tyrrell withdraws his hand things soon fall back into their primitive state. I will not say the general conservancy of Guntur is as bad as when Dr. Bigg Wither first took it in hand, but I will say Guntur is no cleaner generally than many towns in India, indeed not so clean as many I could mention in our Presidency, so its immunity from cholera can scarcely be owing to general sanitary arrangements. But it has an admirable arranged water supply, an arrangement which I should like to see carried out in every town where it is possible ; some little distance out of the town is a fine large tank, almost a small lake, and from this, the water, having first been allowed to run through a large roughly constructed but effective filter, is passed by pipes into the town, and distributed to the inhabitants at various stands. The tank itself is zealously conserved ; its banks are patrolled by peons who rigorously defend it from being polluted by dhobies or people washing themselves therein. To this I consider Guntur owes its immunity from cholera since the time of Dr. Tyrrell, but I should not be astonished at any time to hear of a sudden outbreak of cholera in Guntur ; let the strict watch over the tank be relaxed, let a party of pilgrims encamp on the banks, and use it as pilgrims with cholera amongst

them invariably use a tank and Guntur would lose its present reputation. A water supply to be safe should be beyond the reach of contamination by pilgrims and wayfarers.

Such a water supply is presented to us at Pondicherry. Now Pondicherry. Pondicherry has a singular immunity from cholera even whilst cholera is raging in the neighbouring English towns, Cuddalore, Chellumbrum, &c., of the South Arcot District. By Pondicherry, I mean the town proper of Pondicherry, not the district, for in that cholera has of late made its appearance. Pondicherry Town is supplied with water by artesian wells, and also from a small lake (Montirepoleon) situated some distance outside the town from whence the water is led in by pipes and distributed throughout the town. It is of course impossible to contaminate the source of an artesian well, and great care is taken that the other source shall also be protected. Now as I said above Pondicherry escapes and has for years escaped cholera even while it was raging in neighbouring English districts, I attribute this entirely to its unique water supply. If it is argued it is more likely owing to its general cleanliness and conservancy I answer, that whilst all must admit Pondicherry is a clean town, in that respect an example, still I cannot admit it is so much cleaner than the neighbouring English town Cuddalore where cholera flourishes with much vigour. Nor can I admit the difference is owing to "Telluric," "Atmospheric," or "Local" influences, for to tell the truth these terms convey no very definite ideas to my mind, and seem rather a convenient escape from ignorance than any scientific explanation, but why one may ask should a certain spot in a contaminated district thus suddenly be exempt from these mysterious influences? Its unique water supply, free from contamination, seems to me a much more common sense explanation of the matter.

Let us turn to Madras itself, I mean our Presidency town. The Madras. diminution in the number of deaths from cholera since the Red Hills Tank supply has been available is very remarkable. I have prepared a table from the Sanitary Commissioner's Office which shows this very well.

Years.	Deaths from cholera.	Remarks.
1855	1,956	
1856	805	
1857	1,378	
1858	1,965	
1859	1,082	
1860	2,580	
1861	2,776	
1862	3,635	
1863	1,684	
1864	574	
1865	944	
1866	2,984	
1867	614	
1868	13	
1869	568	
1870	861	
1871	493	
1872	5	Red Hills water supply opened.
1873	6	
1874	...	
1875	879	} Famine years.
1876	2,035	
1877	6,246	
1878	64	
1879	34	
1880	2	
1881	123	} Severe Epidemic in the Presidency.
1882	461	
1883	168	
1884	269	

The Red Hills water supply was opened in 1872, and it will be seen the drop in deaths from cholera was immediate, and persisted during 1873 and 1874. This I take it however was somewhat accidental and not altogether owing to an improved water supply. There was during those years a general absence of cholera in the Madras Presidency. Then came the terrible years of the famine 1875-76-77, when as we know people flocked into Madras from the neighbouring districts, many of them simply to lie down and die, and most deaths to save trouble, were registered as cholera. Then during 1878-79-80 we have very few deaths if we contrast their figures with previous returns from 1855 to 1871. Then came the

years 1881-82-83-84 to my mind the most encouraging of all, for during these years we had one of the severest epidemics of cholera in this Presidency on record, and yet the deaths are comparatively few: contrast these deaths with those from 1861 to 1864. Moreover it was found on enquiry, for I took great pains in the matter, that the deaths which made up even these insignificant figures came from the outlying districts of Madras where Red Hills water was not laid on, Tondiarpettah, Washermanpettah, Royapuram, and Cassemode. And Madras would have a still cleaner bill of health from cholera if a number of old tanks, dirty but popular from long accustomed use were closed.

Dr. Townsend, late Sanitary Commissioner for the Punjaub, Nagpur, whose views concerning cholera and water coincide with mine, sent me lately from England the following instruction table of the deaths from cholera in the city of Nagpur for seven years previous and seven years subsequent to the introduction of water from the Ambaghiri reservoir.

Years.	Cholera deaths in city, popula- tion 84,500.	Remarks.
1865	420	Water from Ambaghiri let on.
1866	387	
1867	...	
1868	44	
1869	412	
1870	1	
1871	4	
1872	23	
1873	...	
1874	..	
1875	*32	*Deaths occurred in a section of the city where Ambaghiri water has not extended.
1876	*61	
1877	3	
1878	69	
1879	12	
1880	...	
1881	60	

Here is what Dr. Townsend writes :—

“ The number of deaths from cholera in the city during the seven years subsequent to the introduction of pure water is less than one-seventh of the number recorded in the seven years prior to

that event (177 against 1,264). Epidemic outbreaks of cholera may be said to have ceased to occur in the city, or at any rate are limited to certain sections *in which open tanks exist*. In many of the cases that occur in the city when cholera is epidemic over the country the disease has been contracted outside."

"Systematic conservancy, *i.e.*, the removal of filth daily from the city was instituted in 1866, but no comprehensive scheme of sewage or drainage has been carried out. The water service extends to 20 of the 26 circles into which the city and station are divided. The better classes in some of the remaining circles fetch the Ambaghiri water for use, but the poorer classes depend upon tanks or wells sunk at the edge of the tanks, and it is in these circles that the deaths from cholera that appear in the city register chiefly occur. Of the 60 deaths from cholera registered in 1881, 31 occurred in *one* of these circles, leaving only 29 distributed over the remaining 25 circles."

"It will be observed that whilst the mortality from cholera has greatly decreased in the city of Nagporo, there has been no diminution in the district; on the contrary epidemics have of late years been frequent and severe."

The literature of Europe is amply supplied with facts shewing that a pure and uncontaminated water supply confers an immunity from cholera. It would be impossible within the short time at my disposal to quote one-tenth of the extracts I have accumulated on this point, but I may draw attention to one or two of the most remarkable.

London.

In a late number of the XIXth Century* (*viz.*, that for August 1883) there will be found a very interesting paper from the pen of Professor Frankland. In this communication the writer points out how London has suffered from cholera on four different occasions, *viz.*, 1839, 1849, 1854, and 1866, and that these epidemics although more or less severe had some very striking and instructive differences. The mortality in 1832 was undoubtedly great, but at that time there was no official registration of the causes of death; according to information received however the Privy Council put down the number of deaths as 5,275, taking the population of this time thus represented a mortality of 36·4 per 10,000.

* The facts here related are also Reported in Mr. Simmon's reports to the Privy Council.

In 1842 the deaths attributed to cholera in the metropolis amounted to 14,137 or 61·8 per 10,000. In 1854 there were 10,738 victims or 42·9 per 10,000 whilst in 1866 cholera was fatal to 5,596 persons or 18·4 per 10,000 of the inhabitants.

This diversity in the mortality during different epidemics is thus accounted for.

In 1832 a considerable part of London was supplied with water abstracted from the Thames and the Lea, the remainder being obtained from shallow wells.

At that time the river water within the metropolis cannot have been nearly so much polluted as subsequently owing partly to the smaller population on their banks, but chiefly to the absence of an efficient system of sewerage in the metropolis. In 1849 the sources of water supply remained substantially the same except that the river water had probably more and more taken the place of the shallow well water. In the meantime however the sewerage system had become fully developed in London. The drainage of nearly the whole population was thus rapidly conveyed into the three rivers from which the water supply of London was drawn, namely, the Thames, the Lea and the Ravensbourne. The rivers became proportionately fouled before distribution. *In fact at this time the water companies rapidly restored to the inhabitants of London the drainage matters which the sewers had discharged.*

It was in this epidemic (1849) that London suffered most severely, the mortality from cholera amounting to nearly 62 per 10,000 of the inhabitants. On examining the mortality more in detail we find on the evidence of the late Dr. Farr, Medical Adviser to the Registrar General that amongst the population supplied with the water taken from the Thames at Kew, cholera was fatal to 8 in 10,000 of the inhabitants, whilst in the districts supplied with the water taken from the river at Hammersmith it was fatal to 17 in 10,000, and again in the population supplied with water abstracted from the river below Chealsea Hospital it was fatal to 47 in 10,000, whilst the districts drawing their supply still lower down, *viz.*, at Battersea and between Hungerford and Waterloo bridges where the river was still more foul, suffered to the extent of 163 deaths per 10,000 inhabitants.

Before the next visitation in 1854, a small portion of the water abstracted from the Thames within the metropolis had been replaced

by a corresponding volume taken from the river above Teddington Lock, and consequently beyond the reach of the London sewage. Corresponding to this improvement in the water supply we find a reduction in the mortality from cholera which in the subsequent epidemic of 1854 was only 43 per 10,000, although in the same epidemic we find that in those districts still supplied with the foul water below Teddington Lock, the mortality was actually greater than in 1849. Thus on the south side of the river the two great competing water Companies are the Lambeth Company on the one hand, and the Southwark and Vauxhall Companies on the other. Of these two Companies in 1854 the Southwark and the Vauxhall still pumped from the Thames at Battersea, whilst the Lambeth had removed their pumping station to Ditton above Teddington Lock. The houses supplied by these two Companies were in the same district, the pipes of the two Companies interlacing and sometimes running parallel in the same street, so that, excepting as regards the water supply the conditions affecting health in the two sets of houses may be safely assumed to have been identical, but whereas the mortality amongst the population supplied with the comparatively pure water of the Lambeth Company was only 40 per 10,000, that of the population supplied with the foul water of the Southwark Company was 130 per 10,000 of the inhabitants.

In the last epidemic which occurred in the year 1866 all the Companies drawing from the Thames had fortunately removed their intakes to points above Teddington Lock, and corresponding to this improvement we find that the mortality fell in this epidemic to 18 per 10,000 inhabitants.

It is however in this epidemic that perhaps the most striking evidence of the effects of drinking water is to be obtained.

In this year certain parts of the East end of London suffered most severely from cholera. These parts of London were in the area of one water Company, and what makes the case more remarkable and conclusive is, that not the whole area of that water Company suffered. The water Company, gave two waters, and the high cholera mortality was apparently restricted to those parts of London which received one of these two supplies, to half the district, so to speak, of the East London Company. The source from which this Company supplied this half of its district was a source peculiarly exposed to contamination from a foul part of the Lea.

On August 1st of that year, 1866, the Registrar General gave notice to the East London Company of the danger of distributing this polluted water supply, and from the day they discontinued, the intensity of the disease began to abate, and within the month the number of deaths from cholera was less in the East end than in other parts of London.

During the past year M. le. Dr. Marey, a member of the Insti- Paris.
tute of the Academy of Medicine in Paris—Professor in the College of France has published a pamphlet “les eaux contaminees et le cholera,” in which the same facts as shown in the article quoted above—*viz*; that in Paris the intensity of cholera was in exact proportion to the contaminated water supply—are very clearly brought out. He shows by a map that cholera was very heavy in Paris on the right side of the river Seine, and very light, almost infinitesimal, on the left. The part of Paris which suffered heavily from cholera was supplied with water from the rivers Seine and Ourcq into which rivers the sewers of Paris empty themselves. Here we have exactly the same state of things as occurred in London in 1849; “the water rapidly restored to the inhabitants the drainage matters which the sewers had discharged.”

The part of Paris which escaped cholera was supplied by water from the wells of Grenelle—“proceeding from a deep spring sheltered from all filth” “which” remarks Dr. Marey, “well explained the immunity enjoyed by the inhabitants who drew their water supply from this source.”

Quite lately a very singular instance of the protection afforded to Gopaulpore.
a community by a pure and uncontaminated water supply has been brought to my notice by Dr. VanGeyzel, Acting District Surgeon, Ganjam. Cholera after having raged with considerable fury in the southern part of our Presidency, crossed the Railway, and slowly made its way northward following the course of the Buckingham Canal. It reached the Ganjam Collectorate, and created more or less havoc in the district, but to quote Dr. VanGeyzel’s own words:—

“The port of Gopaulpore (Ganjam District) has enjoyed a remarkable immunity from epidemic cholera under circumstances which are sometimes considered very favorable to the spread of the disease.”

“Cholera has this year (1885) raged all over the district from Rumbha to Chicacole, and from east to west; the villages in the

neighbourhood of Gopaulpore furnished not a small proportion of cases. When it is remembered that from these very villages, hundreds of coolies go daily to Gopaulpore for work and back again, that a stream of carts (about 150 on an average,) keeps daily pouring into Gopaulpore from various parts of the district, and out again, it goes without saying that Gopaulpore is by no means isolated in any way, but that on the contrary, it has as frequent and large a communication with the interior parts of the district as Aska, or Rumbha, or even Berhampore—in all of which places it may be said that cholera is very seldom absent.”

“During this year, only three cases of cholera occurred in Gopaulpore, these cases arrived already suffering from the disease. In this way the disease has occurred now and again, chiefly among people coming from other places ; but it has not gained a footing.”

“The general sanitary condition of Gopaulpore though much improved of late is by no means what is to be desired. There is, however, one circumstance which makes Gopaulpore unique in respect of its water-supply:—*It has absolutely no tanks whatever.* There are 35 wells in the village (for a population of 2,675 people) good, bad, and indifferent. Lately some good wells have been sunk by Mr. Minchin, who generously allows people to take drinking water from them, and they are freely resorted to.”

“The immunity of Gopaulpore from epidemics of cholera, while it was surrounded with infected villages, with which abundant daily communication took place, as well as with other and more remote parts of the district, especially at a time when cholera was raging epidemically generally over the whole district, and the inability of the disease to establish itself although it was imported on many occasions, point to the want of something by which the disease could be propagated and spread. In this connection, the absolute absence of tanks is well worthy of note.”

Now, what is the remedy for these recurring epidemics of cholera ? If what I have read above is true, if the facts stated are facts, the remedy seems very obvious. Provide the people with a pure and uncontaminated water supply, for drinking and domestic purposes.

At first glance it may seem an almost impossible task to ensure so large a population as Southern India pure water. It is a “big affair,” but not more considerable than many other blessings which have been conferred by a beneficent government on the people of this country, such as “Justice,” “Police,” &c. What has been

done in one place as regards water, say "Guntur" or "Nagpore" can surely be repeated say in "Tinnevelly," "Bellary," and so on until all towns are protected. All India is but the repetition of the unit the "village community."

In a report sent by me as Sanitary Commissioner, on cholera in the Tanjore District, G. O., August 28th, 1881, I drew attention to this matter, and I will here repeat what I wrote.

"I would propose that in every one of these villages a good deep well be sunk, properly made of brick-work and masonry with parapet, sloping sides, &c., under the superintendence of the Local Fund Engineer; in some of the larger and more wealthy villages one or two wells might be constructed. I think the people, as at Negapatam, would come to see the greater advantages of drawing water from such sources to being dependent on tanks. I would even go a step further and in some of the larger villages I would have a pump to raise the water into reservoirs from which it might be drawn by stop-cocks as is being done in Madura, and is to be adopted in Negapatam. The use of small pumps to raise water into reservoirs is common at many stations of the South India Railway. This not only saves much labour, but keeps the well from the possibility of being defiled by dirty ropes and chatties.

The use of driven tube wells commonly called "Abyssinian Wells" is worthy of consideration; it would make this paper too lengthy to go into details, but from a small work on the subject lately published by Mr. John Scott, (Irrigation and Water supply, London, Crosby, Lockwood and Co.), it would seem they are now the form of wells most commonly sunk in many parts of England, and are not expensive as the following extracts will shew.

"At West Thurrock in Essex a Cement Company is pumping from two 5-inch tube wells about 80 feet deep 220,000 gallons per day of 10 hours. Another Cement Work at North Fleet is pumping 60,000 gallons per day. These have been pumped daily for about four years, and still give a constant supply. As expense is an important feature, it may be mentioned that the cost of these did not exceed £60 each. The coupled tube wells are to be found in greatest numbers at the centres of beer manufacture, where abundance of pure and cool water is an absolute necessity. At Burton on Trent about two million gallons are pumped daily from these wells."

I think there ought to be no difficulty as regards ways and means

for I find that during the past four years Rs. 1,17,748 have been allotted in the district of Tanjore for improvement of village sites and water supply of which only Rs. 37,274 have been spent. The balance Rs. 80,474 would sink a good many wells.”

What obtains in Tanjore obtains throughout the Presidency, the amount set aside for the improvement of water supply is never spent. No systematic attempt has yet been made to remedy the water supply.

Nor is there anything repugnant to the religious prejudices of the people, in thus improving their water supplies. On the contrary as I have pointed out elsewhere to keep their drinking water free from contamination is a religious duty strictly enjoined on all Hindus in their ancient Shastras, and as far as I have been able to gather in my various tours in the Presidency the importance of this duty is fully admitted and recognised by all respectable natives.”

Although I feel as sure as I can feel sure of anything that a pure and uncontaminated water supply would considerably diminish and in time practically abolish the enormous mortality of these cholera epidemics, yet if we are wrong and it did not, if the scheme fell short of our (or my) expectations no harm would be done, no useless expense incurred. All Sanitarians are agreed that a pure water supply is, especially in tropical climates, the greatest boon that can be conferred on a community.

The Government is most benevolently inclined towards the millions committed to its charge. I have felt it my duty as a Sanitary Commissioner over and over again to draw their attention to this matter of water supply, and I have always had the most cordial support and encouragement. But the matter rests now mainly in the hands of Local Fund Boards and Municipalities who are apt to think they have no funds to spare for this most necessary sanitary improvement. It becomes necessary for Medical and Sanitary Officers to be persistent, in season and out of season, in their endeavours to bring it about. If the scientific and medical world of Europe come to endorse Burdon Sanderson's lately expressed opinion that every epidemic of cholera which reaches Europe has its starting point in the home of some Hindu* on the bank of the Ganges, they will

* His exact words are “No combination of soil and season however favorable will produce a harvest unless the seed has been sown. It holds true now as ever it did then,” if we possessed the requisite knowledge the disease could always be traced back in lineal descent to its origin in some poor Hindu on the banks of the Ganges, as certainly as the pedigree of a horse or dog can be followed to his remote ancestors.”—*Contemporary Review*, Aug. 1885.

presently take India to task as to what it has done to stamp out this disease. General sanitary arrangements are all very well, and have my most cordial support, but I don't think they will ward off cholera any more than they will set a broken leg. A man with a fractured limb is none the worse for having his house whitewashed and the general sanitary arrangements of his surroundings attended to, but a sensible practitioner will scarcely expect a satisfactory union unless he applies splints; so with cholera whitewash the houses, and clean up generally by all means, but if the water supply is contaminated or open to contamination the inhabitants of the whitewashed houses are not safe. Such at least Gentlemen is my humble opinion after some forty years' experience of this dread scourge.

